Specification

1. Title of the invention

METHOD FOR MANUFACTURING A STEEL BELT FOR CONTINUOUS TREATMENTS

2. Patent Claims

1. A method for manufacturing a steel belt for continuous treatments characterized, with regard to a method for manufacturing a steel belt for continuous treatments by respectively welding the distal & proximal ends of hot-rolled coils with mutually different sheet thicknesses, by the fact that the proximal end of a preceding coil and the distal end of a following coil are welded after their sheet thicknesses have been homogenized by means of pressing.

3. Detailed explanation of the invention

The present invention concerns a method for manufacturing a steel belt for continuous treatments wherein hot-rolled coils with mutually different sheet thicknesses are welded & joined.

Attempts are made, from the standpoint of improving the operative efficiencies of post-treatment processes (e.g., acid washing line, etc.) of hot-rolled coils, to provide an enlarged coil by welding multiple coils. In the case of the acid washing line, for example, an attempt is made to provide a continuous line by welding a preceding coil with a trailing coil by using a welding machine installed on the inlet side thereof.

In a case where such a welding operation is carried out, care must be taken for preventing not only fractures of sheets being transmitted through the acid washing line but also sheet fractures in the course of cold rolling orchestrated as a post-treatment process.

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[1] Numbers in the margin indicate pagination in the foreign text.

In a case where coils with mutually different sheet thicknesses are welded, for example, a stepped welding interface obviously becomes unavoidable, and since the effect of welding becomes insufficient, strength-related problems become incurred. At present, therefore, attempts are made to designate a permissible sheet thickness differential margin at the time of welding coils and to weld only coils bearing a thickness differential within this standardized margin.

In other words, in the case of coils with mutually different sheet thicknesses, the preceding coil (1') & trailing coil (2') with mutually different sheet thicknesses are, as Figure 1 indicates, abutted against one another and, upon the formation of a welding lead portion, welded, and subsequently, beads are cut & removed from the welded interface (4') with a bead knife. In a case where the sheet thickness differential between the preceding coil (1') & trailing coil (2') is substantial and deviates from the aforementioned permissible margin, however, bead residues (4") cannot be avoided even if beads are cut & removed with a bead knife after welding, and press scars become generated under the pervasion of the aforementioned bead residues at the time of cold rolling orchestrated as a post-treatment process. Since stepped welding is unavoidable, furthermore, the welding effect becomes insufficient in a case where the sheet thickness differential is substantial, due to which sheet fractures arise from the welded interface during the sheet transmission through a acid washing line or during a cold rolling process. Attempts have been made in the prior art to prevent these inconveniences by designating a permissible sheet thickness differential standard and by avoiding the joining of sheets deviating from this standard. /2

The following permissible sheet thickness differential standards are presently designated: A maximum of 0.5 mm in the cases of coils with sheet thicknesses of at least 3 mm and a maximum of 0.3 mm in the cases of coils with sheet thicknesses of less than 3 mm. In other words, the welding of coils with mutually different sheet thicknesses bearing thicknesses of at least 3 mm each is, in the prior art, limited to a case where the sheet thickness differential between preceding & trailing coils is 0.5 mm or less, whereas the welding of coils with mutually different sheet thicknesses bearing thicknesses of less than 3 mm each is limited to a case where the sheet thickness differential

between boil coils is 0.3 mm or less. Even if the sheet thickness differential is confined to the aforementioned permissible standard, however, the steel belt for continuous treatments manufactured by the method of the prior art cannot be said to be desirable in terms of strengths due to the arising of a step on the welding interface between preceding & trailing coils.

The objective of the present invention, which has been conceived in acknowledgment of the aforementioned current of affairs of the prior art, is to propose a method for manufacturing a steel belt for continuous treatments capable of expanding the permissible sheet thickness differential margin for mutually welded coils with mutually different thicknesses and of completely preventing the arising of troubles attributed to sheet fractures from the welding interface.

In summary, the present invention concerns a method for manufacturing a steel belt for continuous treatments characterized, with regard to a method for manufacturing a steel belt for continuous treatments by respectively welding the distal & proximal ends of hot-rolled coils with mutually different sheet thicknesses, by the fact that the proximal end of a preceding coil and the distal end of a following coil are welded after their sheet thicknesses have been homogenized by means of pressing.

In other words, the present invention proposes, as a way of avoiding stepped welding, a method wherein the proximal end of a preceding coil and the distal end of a following coil are welded after their sheet thicknesses have been homogenized by means of pressing as a pre-welding treatment. In this case, the respective sheet thicknesses of welded edges may be homogenized based on a method wherein a thicker coil alone is pressed for matching the sheet thickness of a thinner coil or a method wherein the respective to-be-welded edges of both preceding & trailing coils are pressed for achieving a homogenized sheet thickness lesser than the sheet thickness of either coil. Incidentally, the pressing method has been orchestrated as a mechanism for homogenizing the sheet thicknesses of proximal & distal coil edges in consideration of the operative efficiency, facility cost, precision, etc. In other words, it becomes possible to execute an automatic pressing operation by using an extant press machine and also to secure a desired dimensional precision. Moreover, the

press machine does not require a large installation space, and therefore, it can be easily installed in front of the welding machine of an extant continuous line.

Next, application examples of the present invention will be explained with reference to Figure 2 & Figure 3.

Figure 2 instantiates a case where the thicker of a pair of coils alone is pressed and then joined with & welded to the thinner coil, according to which the thicker trailing coil (2) is initially pressed down by the press machine (3) for homogenizing the sheet thickness thereof with the sheet thickness of the thinner preceding coil (1). Next, the respective to-be-joined terminal units of the preceding coil (1) & trailing coil (2) are mutually abutted in a state where their respective centers along the sheet thickness direction are being matched. Subsequently, said abutted units are mutually welded. Since said abutted units are devoid of a step differential, they can be sufficiently welded. Incidentally, welding methods are instantiated by flush vat welding, seam welding, laser welding, gaseous CO_2 welding, arc welding, etc. Upon the completion of welding, beads on the straws (4) are cut & removed with a bead knife. In this case, too, beads can be cut & removed without generating residues by virtue of the mutually identical sheet thickness of the respective joined terminal units.

Moreover, Figure 8 instantiates a case where both the preceding coil (1-2) & trailing coil (2-2) with mutually different sheet thicknesses are simultaneously pressed for homogenizing the sheet thicknesses of their respective to-be-joined terminal units, whereas in this case, both the thinner preceding coil (1-2) & thicker trailing coil (2-2) are simultaneously (or separately) pressed by the press machine (3) in a state where their respective to-be-joined terminal units are being mutually abutted for achieving a desired homogeneous sheet thickness, followed by welding.

Incidentally, the pressed-down unit(s) of each of the cases of Figure 2 & Figure 3 may also be heated for facilitating press molding. Moreover, there are no special restrictions on the length of the pressed-down unit(s), although it is preferably 100 mm or less.

The steel belt for continuous treatments thus obtained is devoid of steps on the welding interface thereof, and therefore, there is virtually no fear of the arising of sheet fractures originating from said welding interface during an acid washing line sheet transmission process or cold rolling process. Moreover, since no bead residues become generated on said welding interface, the arising, during a cold rolling process, of press scars attributed to such bead residues can assuredly be avoided.

In the following, an application example of the present invention will be shown.

(Application examples)

As hot-rolled & acid-washed coils for providing a cold-rolled steel sheet in compliance with JIS G 3141, the respective terminal units of a 3.0 mm (sheet thickness) × 900 mm (sheet width) preceding coil and a 4.0 mm (sheet thickness) × 900 mm (sheet width) trailing coil were abutted against one another, and after the respective to-be-joined terminal units of both coils had subsequently been simultaneously pressed by a 200-ton hydraulic press in the resulting state for achieving a homogeneous molded sheet thickness of 2.8 mm, they were joined based on an ordinary seam welding technique, followed by a finishing operation whereby beads were cut & removed from the welding interface with a bead knife. The thickness-heterogeneous steel belt thus manufactured was transmitted, for achieving a finished sheet thickness of 0.8 mm, through a cold rolling machine, where the transmitted sheet was rolled at a line speed of 1,000 m/min., as a result of which utterly no sheet fractures originating from the aforementioned welding interface were acknowledged. Moreover, utterly no press scars attributed to bead residues were identified.

As the aforementioned application example has demonstrated, it becomes possible, according to the method of the present invention, to weld hot-rolled coils with mutually different sheet thicknesses in a state where their respective sheet thicknesses have become homogenized, to phenomenally enlarge the permissible sheet thickness differential range, to manufacture a steel belt for continuous treatments bearing a desired welding strength, and to assuredly prevent sheet fracture

troubles on an acid washing line or during a cold rolling process. It thus becomes possible to enlarge the hot-rolled coil in an unprecedented manner and to contribute greatly to improved productivities of steel sheets.

4. Brief explanation of the figures

Figure 1 is a demonstrational diagram which shows a method known in the prior art for manufacturing a steel belt for continuous treatments, whereas Figure 2 is a schematic diagram which shows an application example of the present invention, whereas Figure 3 is likewise a schematic diagram which shows another application example of the present invention.

(1) & (1-2): Preceding coils; (2) & (2-2): Trailing coils; (3): Press machine; (4): Welding interface.

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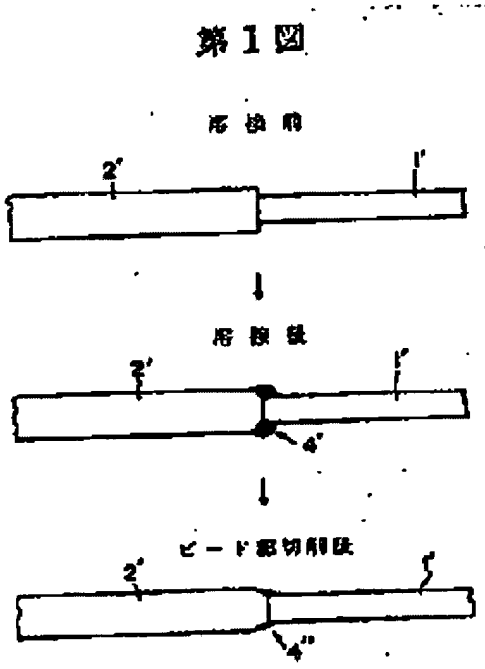
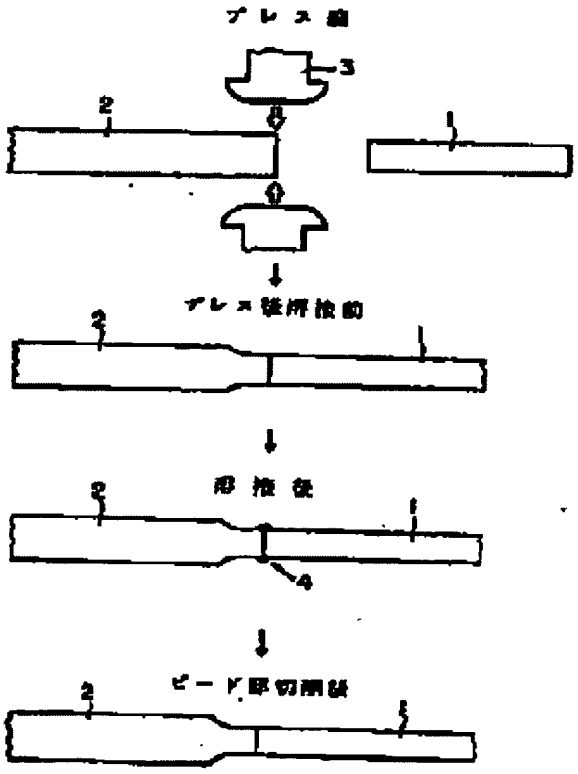
Figure 1



[(A): Before welding; (B): After welding; (C): After cutting & removal of beads]

Figure 2 /4

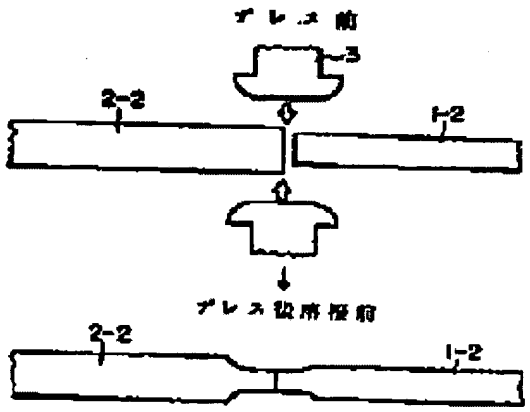
第２図



[(A): Before pressing; (B): After pressing & before welding; (C): After welding; (D): After cutting & removal of beads]

Figure 3

第３図



[(A): Before pressing; (B): After pressing & before welding]